Results: Differences in demographic and prognostic features (age, T stage, Gleason score, pre-treatment PSA, ADT) were not significant.

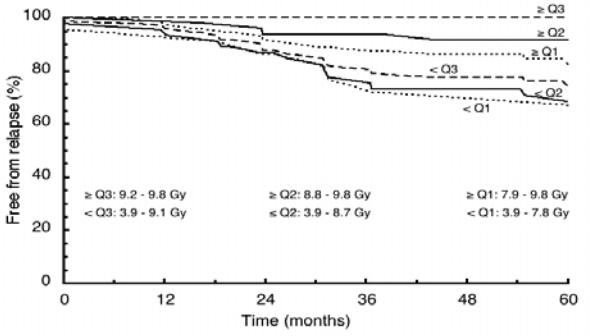

Figure 1. FFbR ranked by D_{90} values ≤ or < the first (Q1) second (Q2) and third (Q3) quartile.

Figure 1 compares time-incidence curves generated using the 1st, 2nd and 3rd quartile D_{90} levels as cut-off points. A progressive, dose related increase in biochemical control of disease is seen with increasing D_{90}. FFbR was significantly higher in patients whose D_{90} was ≥ the median value compared to D_{90} < median (p = 0·006). Similar findings were seen for V_{100}.

Table 1. FFbR at 5 years for D_{90} and V_{100} ranked by first, second and third quartile.

Quartile (Q)	D_{90} (FFbR %)	p	V_{100} (FFbR %)	p
< 1st Q	67	0.05	64	0.04
≥ 1st Q	82		84	
< 2nd Q	66	0.006	65	0.003
≥ 2nd Q	92		94	
< 3rd Q	73	0.04	72	0.03
≥ 3rd Q	100		100	

Table 1 shows 5-year FFbR rates for D_{90} and V_{100}. In multivariate analysis D_{90}, (p = 0.004), V_{100} (p = 0.0004), PSA (p = 0.03) and ADT (p = 0.01) were significant covariates for risk of relapse.

Conclusions: Dichotomising the data using 6 levels of response (above and below Q1, Q2 and Q3) showed a clear dose response with progressive and continuous improvement in biochemical control of disease across the entire dose (and volume) range. The data show that a minimum D_{90} of 108% of the prescribed dose should be the target to achieve. Implant quality is an important predictor of outcome after HDR brachytherapy.

OC-0264

A comparison of three different radiotherapy boost techniques after breast conserving therapy for breast cancer.

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Purpose/Objective: This retrospective study was performed to compare different boost techniques after breast conserving therapy (breast conserving surgery followed by whole breast irradiation) in terms of local and loco-regional recurrences.

Materials and Methods: From 2000 to 2005, 1576 patients were treated with breast conserving therapy for in situ or invasive breast cancer. An electron boost (EB) was performed for a superficial boost-volume (less than 29 mm under the epidermis), in all other cases a brachytherapy boost (BTB) was proposed. When patients refused a BTB or a BTB was not possible because of technical reasons, a photon boost (PB) was given. 75.8% (1195) of the patients received an EB after whole breast irradiation (WBI). 16.3% (257) of the patients were given a BTB (either with LDR or PDR) and only 5.6% (89) of the patients had a PB. The primary endpoints were local and loco-regional recurrences. Secondary endpoints were metastasis-free survival and overall survival, taking into account patient and treatment characteristics.

Results: The median follow-up for all patients was 8.9 years in invasive cancer and 8.8 years in in situ cancer. Of the 1381 invasive breast cancer patients, we observed 35 (2.5%) local and loco-regional recurrences. Five- and 10-years relapse-free survival rates were 98.8% and 96.9%. Five- and 10-years overall survival rates were 95.1% and 86.2%. We found no significant differences between the three boost techniques with respect to relapse risk or overall survival. The metastasis-free survival was longer in the EB group (90.7% at 10 years) and the BTB group (87.3% at 10 years) than in the PB group (82.7% at 10 years). This difference was not significant anymore after correction for tumor stage (pT) (p=0.09) or lymph node stage (pN) (p=0.1). Of the 195 patients with an in situ carcinoma, we found one local and one loco-regional recurrence. Five- and 10-years overall survival rates in this group were 99.5% and 93.8%.

Conclusions: In women treated with breast conserving therapy followed by a boost irradiation to the tumour bed, the local and loco-regional recurrences at 10 years in our institution are very low for invasive as well as for in situ breast cancer. No difference in recurrence was observed comparing the three different boost techniques.

OC-0265

Dose-response for local control in image guided cervix brachytherapy in the retroEMBRACE study

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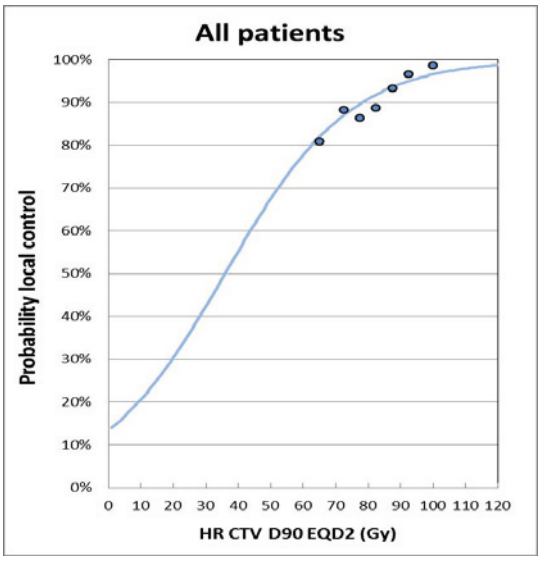
Purpose/Objective: There is currently limited evidence for HR CTV dose planning aims in locally advanced cervical cancer. This study analyses dose-response for local control in image-guided adaptive brachytherapy (IGABT).

Materials and Methods: RetroEMBRACE is a retrospective study with 796 locally advanced cervical cancer patients treated in 12 institutions by IGABT using GEC ESTRO guidelines. In 592 patients data was available on local status, HR CTV dose and volumes. FIGO stage distribution was IB (19%), IIA (7%), IIB (50%), IIIA (3%), IIIB (18%), IV (3%). IGABT was combined with 45-50Gy whole pelvis EBRT and weekly cisplatinum (76%). IGABT was based on MRI (81%) or CT (19%), and was administered as high dose rate (HDR) (60%) or pulsed dose rate (PDR) (40%). Patient groups were formed according to 1) tumour width at diagnosis (cut-point 50mm), 2) HR CTV volume (cut-point 35cc), 3) stage (IB, IIA-IIB, III-IV), 4) histology (SQ versus AC+AdSq), and 5) dose rate (HDR versus PDR). HR CTV D90 dose-response for local control was evaluated in each sub-group by logit analysis. Dose for 90% and 95% local control (TCD90 and TCD95) was determined.

Results: At a median follow up of 31 (3-150) months, 48 local failures have been observed. HR CTV volume was 35cc±24cc and HR CTV D90 87Gy±14Gy. A significant (p<0.05) dependence of local control on D90 for HR CTV was found in the entire patient population (Figure 1) and in all subgroups except PDR (p=0.07) (Table 1). Logit analysis was not performed in stage IB due to limited number of events: 2/32 (6%) and 0/83 (0%) local failures above and below 80Gy, respectively. In the 'favourable' subgroups 'width<50mm', 'HR CTV volume<35cc' and 'stage IIB', local control >95% was seen for HR CTV D90 larger than 87Gy, 85Gy and 93Gy, respectively. In the 'unfavourable' subgroups 'width>50mm', 'HR CTV volume>35cc', 'IIIA, IIIB, IVA', local control rates of >90% was seen for HR CTV D90 larger than 85Gy, 89Gy and 93Gy, respectively. There was no significant difference between dose response for HDR and PDR (p=0.113). There was a significant difference between SQ and AC+AdSq (p=0.02) with AC+AdSq being less favourable, in particular for lower doses.

	all patients	HR CTV volume		Tumour width at diagnosis		Histology		Stage		Dose Rate	
		≤35cc	>35cc	≤50mm	>50mm	SQ	AC + AdSQ	IIA+ IIB	IIIA + IIIB + IVA	HDR	PDR
p-value	<0.001	0.001	0.04	0.05	0.009	0.002	0.004	0.037	0.006	<0.001	0.085
TCD90 [Gy]	78	76	89	87	85	79	85	72	93	82	79
TCD95 [Gy]	82	83	110	87	98	81	91	83	106	90	82



Conclusions: Dose response for local control based on D90 of HR CTV is significant in a multicenter setting. Overall local control can be obtained in 95% of the patients when D90 of HR CTV>92 Gy. The analysis further points to FIGO stage, tumour width at diagnosis, volume of HR CTV and histology as important determinants for TCD90 and TCD95.

POSTER DISCUSSION: 7: RTT

PD-0266

A survey of UK practice in cervical cancer radiotherapy aimed at developing trial specific quality assurance

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Purpose/Objective: To determine the current variation in radiotherapy practice for the treatment of cervical cancer across the United Kingdom (UK) with the aim of developing a comprehensive radiotherapy quality assurance (QA) programme for both external beam radiotherapy (EBRT) and brachytherapy within the context of the INTERLACE trial: a phase III trial of weekly induction chemotherapy and chemoradiation versus standard chemoradiation. The data will also be used to help determine the need for a national brachytherapy dosimetry audit.
Materials and Methods: A pre-trial questionnaire was circulated to 31 radiotherapy centres that had expressed interest in participating in INTERLACE. In addition to external beam radiotherapy (EBRT) details, in depth information on brachytherapy technique and QA was collected.
Results: To date, 22 questionnaires have been completed and evaluated. Local practice was seen to vary significantly between centres with particular variation in brachytherapy techniques. For EBRT, all but 2 centres localise using CT and MRI modalities, only 6 of these also utilise PET imaging. Seven out of 22 centres use 3D virtual simulation (Vsim) techniques for EBRT planning. With respect to total EQD2 dose, 9 out of 22 centres did not achieve the proposed minimum dose requirement for the trial of 78 Gy, with values ranging from 68.3 to 83.9 Gy. The intended trial requirement for the overall treatment time of ≤ 50 days was also not met by 7 of the 22 centres. Out of 21 brachytherapy centres, 18 use 3D imaging for the planning of all fractions. Twelve of these optimise their plans for each individual patient; 6 to the target volume and 6 to OAR volumes or ICRU points, while the remaining 9 use standard plans. Six out of 21 centres have not participated in any brachytherapy dosimetry audit to date.
Conclusions: The INTERLACE pre-trial questionnaire has revealed a wide variation in dose fractionation and treatment techniques being used in centres across the UK. Following our results new minimum standards for centres wishing to participate in the INTERLACE trial have been set. Now Vsim techniques for EBRT planning will not be permitted from UK centres. This will therefore require an advance in technique to 3D conformal planning for some centres. Several centres will be required to increase their total EQD2 dose for trial patients. The overall treatment time has now been amended to up to 56 days. Finally our results have highlighted the need for a national brachytherapy dosimetry audit which is now currently under development.

PD-0267

A comparison of two radiosurgery delivery techniques for brain metastasis.

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Background: Our instituition has been treating brain metastasis using LINAC based stereotactic radiosurgery with micromultileaf collimator (Brainlab M3) since 2008. Patients are immobilised using Brainlab fixation and treated with static fixed fields (6MV photon). In June 2012 a TrueBeam STX (Varian Medical Systems) was installed. Patients with localised CNS lesions are now treated with 10MV flattening filter free (FFF) volumetric modulated arc therapy VMAT.
Purpose: This study evaluated the impact of the new technique by comparing beam on time (BOT), time in room (TIR), and clinical dose rate (CDR) with the previous technique.
Materials and Methods: BOT (minutes:seconds) is the aggregate ''beam-on'' time for all fields or arcs in a given plan. TIR (minutes:seconds) is measured from the first alignment image to last beam off, inclusive of all pre-treatment imaging studies and/or shifts. Static field patients had MV imaging only. VMAT patients had kV imaging and pre-treatment cone beam CT (CBCT). Clinical dose rate (CDR) (MU/min) is the number of monitor units (MU) divided by the BOT. Treatment records were reviewed for 20 patients on Varian Eclipse and Offline review. The median planning target volume was 5.41cm^3 (min 0.98cm^3 max 18.88cm^3). 18 patients had single metastasis, 2 patients had 2 mets.10 patients were treated with 6MV static fields (between 4 and 6 fields) and 10 patients with 10MV FFF (All 10 Patients had 2 arcs). 11 patients were treated with 20Gy, 7: 18Gy and 2: 15Gy.
Results

	6X STATIC	VMAT
BOT	5:85 Range 4:55 - 6:6	2:60 Range 2:01 - 3.9
TIR	34:17 Range 20:42-58:13	17:12 Range 12:42 - 28:28
MU	2726 Range 2119-3168	MU 6216.5 Range 4472-9340
CDR	600 MU/min	2385.5 MU/min

Conclusions: The implementation of VMAT FFF has dramatically reduced the TIR. The shorter BOT reduces the likelihood of intrafraction motion although this cannot be verified as no post treatment CBCT was performed. It is envisaged that VMAT FFF treatment times will be reduced further as Radiographer competency and skill increases. This is essential in busy RT departments where treatment slots are at a premium.

PD-0268

Using systematic CTC registration in the clinic to aid competent care of acute side-effects of radiotherapy

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Purpose/Objective: This study examined the use of Systematic Common Terminology Criteria for Adverse Events v. 3.0 (CTC) registration to enable consistent patient care and prevention of acute side-effects from radiotherapy (RT). The goal was to enhance the ability of the radiation therapist nurses (RTN) to evaluate and act on acute side-effects. Hence we investigated whether performing CTC registration on specific weekdays compared to doing the registration on specific treatment fractions improved the quality of patient care as well as the toxicity data collection. Furthermore, we studied whether CTC registration combined with prior delegated medical actions and supplementary nurse prescribing reduced the need for physician consultations and interventions.
Materials and Methods: We randomly selected 20 patients treated with RT for rectal cancer during October 2011. At that time point, CTC registration was done on every fifth day of the patient's treatment course. We evaluated the relative number of planned CTC registrations actually performed and all medical interventions. This was compared to similar data collected for 20 randomly selected rectal cancer patients treated during October 2012, where CTC